

Suckling behaviour in captive *Dendrohyrax arboreus* (Mammalia: Hyracoidea)

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The suckling behaviour in four consecutive litters of a captive female *Dendrohyrax arboreus* is described. The young showed teat constancy which was established by day four of age without aggressive interactions, and maintained until weaning in all multiple litters. A preference for the more productive inguinal teats was apparent. Frequency of suckling bouts decreased with time but their duration increased. Most suckling occurred shortly after dawn and before dusk. The female showed decreasing maternal care in each successive litter.

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Die sogingsgedrag in vier opeenvolgende werpsels van 'n wyfie *Dendrohyrax arboreus* in gevangenskap word beskryf. Die jongelinge het getrouheid aan tepel getoon, wat reeds teen die ouderdom van vier dae tot stand gekom het, sonder agressiewe interaksies. Die tepelgetrouheid is in alle veelvuldige werpsels tot spening behou. 'n Voorkeur vir die meer produktiewe inguinale tepels was duidelik. Frekwensie van soging het mettertyd afgeneem, maar die duur daarvan het toegeneem. Die meeste soging het kort na dagbreek en voor skemer plaasgevind. Die wyfie het 'n afname in moederlike sorg getoon met elke opeenvolgende werpsel.

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Hoeck (1977) has shown that *Procavia* and *Heterohyrax* exhibit teat constancy which has also been reported in cats (Ewer 1959; 1960), pigs (Donald 1937; McBride 1963 quoted in Hoeck 1977) and rats (Bonath 1972). In the present paper teat preference is described for *Dendrohyrax arboreus*.

Procavia and *Heterohyrax*, the other genera in the order, have six mammae (Bothma 1971; Hoeck 1978) but in *Dendrohyrax* the number varies from two to six (Hahn 1959); one or two pairs inguinally and one pectoral pair. The number of mammae is to some extent diagnostic at the subspecies level (Hahn 1959).

Three species are recognized in *Dendrohyrax*, *D. dorsalis* (Fraser 1854), *D. arboreus* (A. Smith 1872) and *D. validus* (True 1890). While both *Procavia* and *Heterohyrax* have been the subject of several studies (Coe 1962; Rahm 1963; Sale 1965a,b,c; 1966, 1969, 1970; Turner & Watson 1965; Hoeck 1975, 1977, 1978; Steyn 1980) very little has been published on *Dendrohyrax*. The available literature deals mainly with *D. dorsalis* and *D. validus* (Rahm 1957; Richard 1964; Kundaeli 1976a,b; Seibt, Hoeck & Wickler 1977). The present study was undertaken to establish some basic data on the behaviour of the little known *D. arboreus*.

Materials and Methods

An adult female *D. arboreus* was trapped in December 1978 in the attic of a house in Nairobi, Kenya, where she was free living. Four litters were born to her in captivity (Table 1).

Table 1 Litters born to female *D. arboreus* in captivity

Date born	Litter size	Sex	Litter No.
1 June 1979	2	m,f	1
6 November 1980	2	m,f	2
17 December 1981	2	f,f	3
16 November 1982	1	f	4

Observations on suckling behaviour were made between June 1979 and March 1983 for a total of 1 500 h. Litter 1 was observed from day four after birth, Litters 2, 3 and 4 were observed continuously for 24 h from the first day of birth; Litter 3 from the moment of birth and Litters 2 and 4 from 2–4 h after birth. Observations were continued until weaning. One infant in each litter was clipped on the rump for easy identification from the rear.

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Data were recorded noting the time each individual started and stopped suckling, the teat each infant suckled, which animal initiated and terminated suckling, displacement between siblings and any disturbances that may have caused termination of suckling. If an infant suckled from two teats during one bout each teat was recorded as one suckling event. The female here described had two pairs of mammae, one inguinal and one pectoral.

Results

Suckling positions — establishment of the pattern

The pattern of teat preference was significantly consistent for all infants. The preferred, primary site was either the right or the left inguinal teat, secondary preference was the other inguinal teat, third preference the pectoral on the primary side ($\chi^2 p < 0,001$). The other pectoral teat was never observed to be used (Table 2). Pectoral teats were used rarely (4,2%, $n=908$ suckling bouts) and 71% of pectoral suckling occurred during the first month of life.

Table 2 Suckling preferences for young in Litters 1, 2, 3 (multiple litters) from time the young were first seen until weaning

Primary inguinal teat	Secondary inguinal teat	Pectoral teat on primary side
85,8% (779 observ.)	10,0% (91)	4,2% (38)

$n = 908$ suckling bouts.

Teat preference was established within four days after birth. When Litter 1 was first seen on day four the pattern of preferred teat use was already evident. In Litter 2 suckling was first observed when the young were 4 h old. During this bout the male, after a few seconds of feeding on the left, changed to the right inguinal teat, the female suckling from the left. These were their subsequent preferred positions. Even during the first three days the primary preferred teats were used in 87% of suckling bouts ($n=31$). No aggression was noted during the first observed feeding. In Litter 3 first definite suckling for the firstborn female was at 90 min after birth when it suckled on the right inguinal teat. First definite suckling for the second-born female was at 40 min after birth suckling on the left inguinal teat. Positions at first suckling were those later adopted as primary sites. For the first three days, however, the later primary preferred positions were only used in 28% of suckling bouts ($n=45$) while from day four to time of weaning this percentage increased to 88% ($n=118$).

In Litter 4 the single female young showed less constancy in teat preference. During the first 18 days the young had a consistent preference for the right inguinal teat (90%, $n=41$) but after that, it began using the other inguinal teat more frequently and usage of the two inguinal mammae was equal (right 10, left 9, $n=19$) for the period up to weaning.

Competition

Even when only one young suckled, it was mostly from its preferred position, but occasionally it suckled intermittently from both inguinal teats. Sometimes the second to start feeding tried to push its 'poaching' sibling away but such instances were rare. Upon arrival of its sibling the suckling infant usually moved spontaneously back to its own side.

Only in Litter 1 was forceful displacement noted. The male

infant made seven successful and three unsuccessful attempts at displacing his sister, while the female was successful three times in displacing the male ($n=321$ suckling bouts).

The day after birth of Litter 4 the 11-month-old female from Litter 3 suckled once in the position she originally held, the left inguinal teat, while the newborn suckled in its favoured position, the right inguinal. Two days later the 11-month female nuzzled the teats but did not feed again.

Initiating and terminating suckling bouts

Suckling was initiated significantly more often by the young than by the mother ($\chi^2 p < 0,001$). The mother initiated suckling by vocalizing (grunting) and/or by changing her position to expose her mammae, standing with arched back. The young solicited suckling by nuzzling the mother's face and vocalizing (twittering) and/or by a brief nose to nose contact with her. Suckling was also terminated more often by the young ($\chi^2 p < 0,05$) than by the mother, who terminated suckling by moving away or changing her position. Sometimes an outside disturbance terminated the bout (Table 3).

Table 3 Initiation and termination of suckling bouts in Litters 1 and 2 from time the young were first seen to the time of weaning

Initiation ^a				Termination ^b					
By mother		By young		By mother		By young		Disturbance	
No.	%	No.	%	No.	%	No.	%	No.	%
6	3,2	184	96,8	74	33,0	120	53,6	30	13,4

^a $n=190$ suckling bouts; L 1 (weaned at seven months) mother initiated only during first three months, L 2 (weaned at six months) mother initiated only during first month.

^b $n=224$ suckling bouts; In L 1 during first two months mother terminated in only 8% of bouts ($n=52$).

Vocalization by the mother was not confined to summoning the young for suckling; she frequently vocalized during suckling bouts. Approximately one minute after the young started to feed one to three bouts of grunting would occur.

Duration and frequency of suckling

Average suckling time was 168 s ($n=394$) ranging from a few seconds to over 480 s with a few short stops during these bouts lasting more than 300 s. These longer bouts occurred after three months of age.

Mean frequency of suckling during the first 24 h was once every 1 h 35 min for Litter 2 and once every 58 min for Litter 3. During five 24-h periods during their first month Litter 2's mean suckling interval was 2 h 30 min. Between 07h00 and 19h00 the average suckling interval was 1 h 48 min. Some bouts may have been missed if they occurred in the animals' shelter, especially at night, but a creaky twitter by the young or the

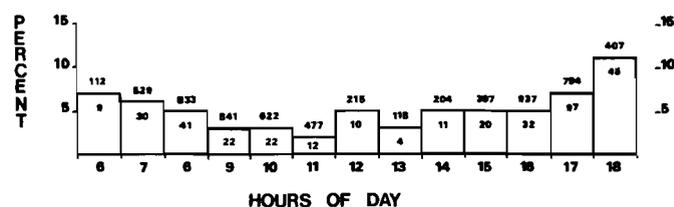


Figure 1 Frequency of suckling bouts for first six months of Litter 1.

grunting of the mother during feeding usually drew attention to the event.

Suckling frequency distribution for Litter 1 between 06h00 and 19h00 (dawn to dusk) shows that most feeding occurred during the period 06h00 and 07h00 and 17h00 and 19h00 (Figure 1).

Litter 1 was last seen suckling when a little over 7 months old, Litter 2 at age 6 months, Litter 3 at four months and Litter 4 at three months.

Discussion

This study shows teat constancy in *Dendrohyrax arboreus*, similar to that shown for *Procavia* and *Heterohyrax* by Hoeck (1977). The consistent preference for the inguinal teats in *D. arboreus* is probably due to a higher milk yield from these mammae. Ewer (1960) noted that the preferred, posterior mammae in cats have a higher milk output and Steyn (1980) found that the glands of the inguinal mammae in *Procavia* were consistently more developed.

In cats teat ownership is established after three days (Ewer 1960). Hoeck (1977) noted that in one *Procavia* litter of twins teat order was established on day two and remained unchanged thereafter. *D. arboreus* seems to establish teat constancy by day four after birth.

Ewer (1960) has shown that kittens respond not to the anatomical position of the mammae but to some unknown, possibly olfactory, stimulus which is not functional until some time after the first young is born. Kittens born later suckled sooner after birth than the firstborn. Similarly in Litter 3 the second-born *D. arboreus* suckled soon after birth while the firstborn suckled only after an interval of one and a half hours after it was born.

Twittering as begging occurs also in the young of other *Hyracoidea* (Sale 1965a; Fourie 1977). Sale's 'whinnying' and Fourie's 'cooing' during suckling are probably equivalent to the 'grunting' by the mother *Dendrohyrax*. Grunting may summon the young to suckle or, when only one infant is at the teats, it may inform the missing young that suckling is in progress. It may also function in stimulating the young to suck harder at the teat.

In the present study the mother showed a decreasing amount of care through time for the young of each litter, consistent with the expected pattern of gradual weaning. However, she also showed a decreasing amount of care for each successive litter as shown by shortening lactation periods (7, 6, 4 and 3 months) and a decreasing frequency of initiating suckling. The age of the female is not known, but judging from the condition of her teeth she may have passed her peak reproductive period.

Although *D. arboreus* is generally believed to be nocturnal, most suckling occurred shortly after sunrise (between 06h12 and 06h43) and before sunset (between 18h22 and 18h52). General activity in the colony also started at dawn and stopped at sunset (Rudnai 1984). When suckling frequency decreased these suckling periods were the last to be retained.

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